

THE GLASGOW SCHOOL OF ART

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Masters in Architecture (Taught) Urban Buildings
Mackintosh School of Architecture
Glasgow School of Art

Maneck Tandon
M. Arch (Taught) Urban Buildings
2004—2005

Final Report
Masters in Architecture (Taught) Urban Buildings

**Mackintosh School of Architecture
Glasgow School of Art**

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OF ARCHITECTURE

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Acknowledgements

This is perhaps the easiest and hardest task. It will be simple to name all the people that helped to get this done, but it will be tough to thank them enough. I will nonetheless try...

First of all I would like to thank everyone at the GSA. Without their support and encouragement this would never have been possible. Special thanks to Alan and Craig for being so helpful and patient.

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My close friends, which are too many to mention, who were always there to encourage me, correct me and cheer me on.

My final words go to my family, without whose support encouragement and guidance I would not be where I am today.

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Introduction

*"A building begins with light and ends with shadow"*¹

Architects over the years have always taken a keen interest in light. From Greek temples to contemporary buildings, architects have always exploited natural light to create a space- an atmosphere which evokes emotions. Light is the first element of design, without it there can be no colour form or texture. This essay is an attempt to understand the use of natural light in a specific building and analyzing it with the help of photographs which illustrate the use of day lighting. The building selected for this study is the Glasgow School of Art, designed by Charles Rennie Mackintosh in 1896. This particular building was selected for study as I am enchanted by the various moods created within the building. The



Fig.2 Scottish Baronial Castle

darkness, the lightness and the emotional feelings Mackintosh gives us through the varied use of sunlight and day lighting. I am also intrigued by the schedule of the conditions of competition for the building, in which the description for the principal rooms always refer to the type and location of desired light, for example the Flower Painting Room "...may be lighted from the ends or by a north-top light, and should have attached to it a conservatory, with an exposure to the sun, in which plants and flowers, when not in use may be kept."²

The quality of natural light is always specific to a global location and the surface it

reflects off from a green jungle to white arctic ice. It changes not just with the latitude and longitude but also the altitude and the season. For example the quality of light in Fez, Morocco (Latitude 34.05

N) is strong hard and direct as compared to the light in Glasgow (Latitude 55.50 N), which is softer and more oblique. This factor is evident in the vernacular style of architecture. Buildings in hotter more tropical climates where the sun shines directly above are designed with smaller openings, and screens and built around a courtyard. The courtyards in turn often have a water feature and foliage. This configuration allows light reflected from the courtyard to enter the building. (Fig. 1) The screens permit visual continuity but block excess light. The water and foliage help in the scattering of light as well as having a cooling effect and creating a micro- climate. Buildings further away from the equator have little or no overhead sun. The sunlight at these latitudes is more angular and lower, most of the sunlight is allowed to come into the building through tall openings, making maximum use of all available light. Similarly the Scottish Baronial style is characterized by tall windows which permit the low angular sunlight to enter deep into the

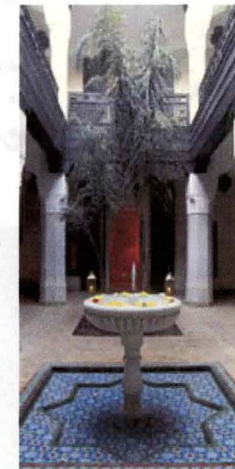


Fig.1 Courtyard in Fez

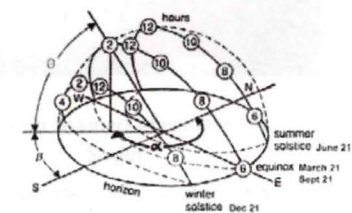


Fig.3 Sun path diagram

¹ Kahn, I Louis

² Conditions of Competition, F ;Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994

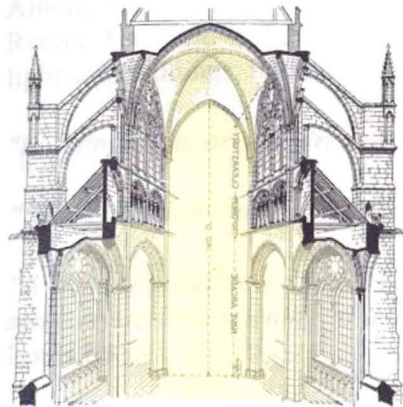


Fig.4 Section through Abbot Suger

building. (fig.2) High latitudes have distinct summer and winter conditions while the seasonal variation of daylight levels is less apparent at low latitudes. At high latitudes where winter daylight levels are low, designers usually aim to maximize daylight penetration in a building from the brightest regions of the sky as an appropriate strategy for these latitudes. By contrast, in the tropics where daylight levels are high throughout the year, the design emphasis is usually on preventing overheating by restricting

the amount of daylight entering the building. The obstruction of large parts of the sky, especially of areas near the zenith, and the admission of daylight only from lower parts of the sky or of indirect light reflected from the ground are the usual design strategies adopted.

It is light that enables architecture to reveal form texture and volume. A huge gulf arises when one attempts to express this visual experience in terms of words. The subtle qualities of light, do not fit easily into a verbal or mathematical explanation. Each person's eyes see and experience light differently.

Day lighting and architecture are inexorably linked. Architects through the ages have explored the inherent beauty of natural light.

For example in the 13th and 14th century gothic cathedrals, a transcendent clarity was achieved in the juxtaposition of low northern light and colored glass. This is evident in Abbot Suger of Saint Denis in France. Envisaged by a Benedictine monk named Suger who realized his life's dream of "building an abbey to illuminate men's minds so that they may travel through apprehension of God's light."³ True to the style of Gothic architecture, light is not forced through small apertures but clashes against large surfaces of glass. The light streaming through the stained glass windows has a poignant effect, forming a translucent gateway, revealing the world of saints and angels. The windows form a bridge between the physical and the spiritual world. (Fig. 6,7)

³ Panofsky Erwin, Abbot Suger on the Abbey Church of St. Denis and Its Art Treasures, (Princeton University Press, 1979)

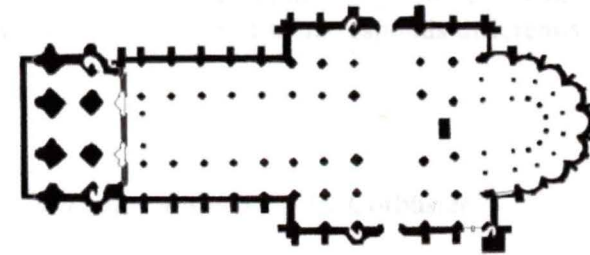


Fig.5 Plan of Abbot Suger

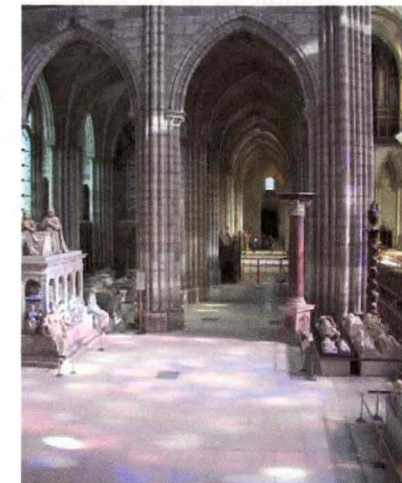
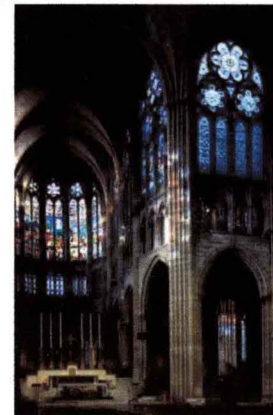


Fig.6 Stained glass interiors of Abbot Suger

Fig.7 Stained glass interiors of Abbot Suger

Amongst the 19th and 20th century architects who took great care and interest in the manipulation of light were Frank Lloyd Wright, Charles Rennie Mackintosh, Le Corbusier, Louis Kahn. Each one found a disparate solution to lighting up a space, each of them responds differently to light and buildings, but they all design around it, at times to include it and at times to block it.

"Buildings, too, are children of Earth and Sun" Frank Lloyd Wright⁴

*"Space and light and order. Those are the things that men need just as much as they need bread or a place to sleep"*⁵ – Le Corbusier

*"A plan of a building should be read like a harmony of spaces in light. Even a space intended to be dark should have just enough light from some mysterious opening to tell us how dark it really is. Each space must be defined by its structure and the character of its natural light"*⁶ – Louis Kahn

Light is important to architecture. This is evident from their words. To understand light and architecture, their buildings have been studied bearing natural lighting in mind. The understanding of light developed from these case studies has been applied in analysis of the natural lighting at the Glasgow School of Art.

⁴ Quotes by Frank Lloyd Wright <http://www.geocities.com/SoHo/1469/flwquote.html>

⁵ Le Corbusier, recalled on his death August 27, 1965; www.bsa-architects.com/articles/quotes.html

⁶ Wurman, R.S: What will be has always been. The words of Louis Kahn; progressive architecture 1969, special edition, wanting to be: the Philadelphia school; pp.89 (MIT Press, Cambridge, Mass., and London, 1973)

Frank Lloyd Wright: Unity Temple⁷ (Oak Park, Illinois; Latitude 41.885N)

"the space is flooded with light from above (to) get a sense of a happy cloudless day into the room... the light would, rain or shine have the warmth of sunlight."⁸

Frank Lloyd Wright plays the game of light and shadow in his unity temple with great skill. The entire journey to the main sanctuary is orchestrated with the play of light and shadows.

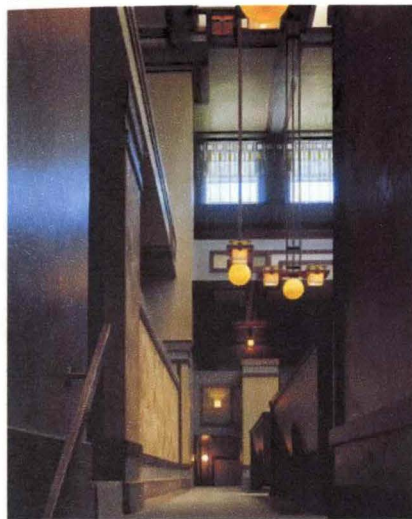


Fig.8 Clear storey lighting at Unity Temple

One enters the building at the lowest level, through the foyer, which is lit up by natural light streaming through the entrance doors and the glass partition from unity house. Once inside instinctively one is drawn towards Unity House, but is lead in the opposite direction towards the darkest side of the foyer. The dimly lit foyer leads into an even darker cloister. The level of the sanctuary floor being a few feet higher than the cloister reveals from the gap, the sanctuary space, illuminated from above by skylights and clerestory windows. This movement from light to dark and then back to light heightens the senses and builds up the anticipation of entering the main sanctuary.

Wright's carefully orchestrated lighting during the entrance sequence makes the central sanctuary space appear brighter than it actually is, giving the room the impression of a sacred space filled with condensed and concentrated natural light.

A grid of beams opens up the volume of the central sanctuary. Twenty-five square stained glass skylights in a complex pin-wheeling pattern are set into this grid.

Above the balconies is a continuous plane of windows under the projecting roof slab. Wright set the windows right into the concrete to minimize the window framing and to create continuity between the inside and outside.(Fig.7).

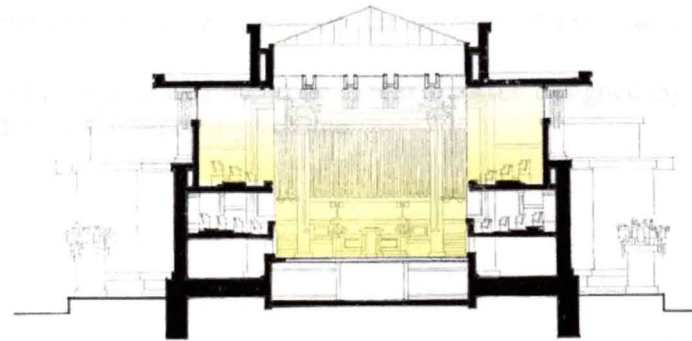


Fig.7 Section showing natural lighting in Unity Temple

⁷ Study conducted through various books/ articles on the works of FLW;
McCarter Robert, Frank Lloyd Wright, (Phaidon Press, London 1999)
Eric Peter Nash FLW-Forces of Nature(TODRI, New York,1996)
Bardeschi, Marco Dezzi, FLW (Hamlyn, London 1970)
Pfeiffer, Bruce Brooks, FLW (Taschen, Köln, 1991)

⁸ Wright, Frank Lloyd; www.quotationspage.com

Charles Rennie Mackintosh: Hill House⁹ (Helensburgh, Scotland Latitude 56.01N)



Mackintosh, a contemporary of Wright also attempted to include and balance natural lighting with electric lighting. He enjoyed accentuating the transition from one space to another by the play of light and contrasting white and black. In Hill House he brings light into the dark oak library, through double height windows. Slit windows on the west catch the last rays of the setting sun. Contrasting to the library is the White bedroom. The play of contrast is again visible when the white drawing room (fig.11) is reached through a dark hall (fig 10). The hall is often compared to

an enchanted forest. In the drawing room the darkness of the forest is replaced by a silver birch grove, light flooding in through the south facing extended bay windows. This play of contrast is also evident in the Glasgow School of Art.



⁹ Study conducted through various books/ articles on Hill House and Charles Renie Mackintosh
 The Hill House, Helensburgh (The National Trust for Scotland, Edeinburgh,1982)
 Ellis, Anne, The Hill House (National Trust for Scotland, Edinburgh,1999)
 Miller, Charles, The Hill House: the residential masterwork of Charles Rennie Mackintosh(Fine Homebuilding : June-July 1989 ; no.54)

Le Corbusier: Ronchamp¹⁰ (Ronchamp, France; Latitude 47.7N)

Corbusier in his Ronchamp seems to have designed the chapel from inside out. The interior's power, space, and silence are expressed through the clever control of the penetration of light and the massing of the walls and roof. Fig.13 shows the plan of the church. Like traditional European churches, the space is divided into a single nave with small side chapels. These towers above the side chapels are another mechanism to let light inside the building they rise above the lower mass to capture light coming from the sky and conduit it to the inside, carefully controlled and colored to give each chapel a

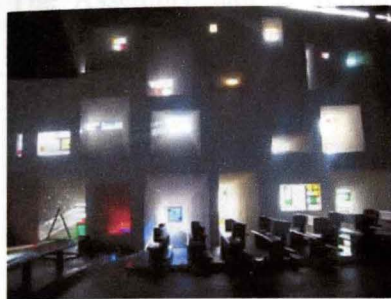
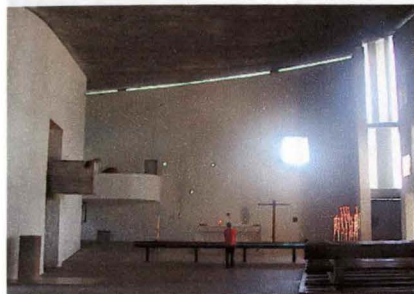


Fig.16 South wall, interior view



separate identity and intimacy. Light draws the eye to specific statues, while shadows provide private areas for prayer and reflection. In the south the relationship between light and architectural form is expressed in a more dynamic way: the south wall seems to be perforated by the force of light. On the South elevation, the angle of the wall and the roof allow more sunlight to get into the interior space from windows of varying sizes. Moreover, every window also adjusts its angle in depth to get direct sun light at different times. Light comes through these windows as shafts rather than a glow, this is captured in fig.16.

Fig.17 Photograph of interior of church

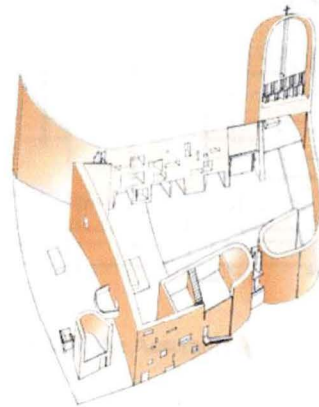


Fig.14 Axonometric view of Church

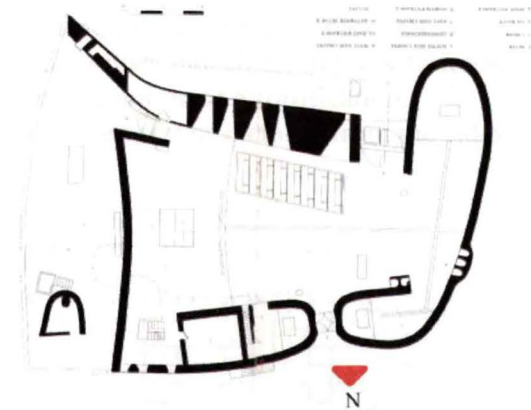


Fig.13 Plan of Church

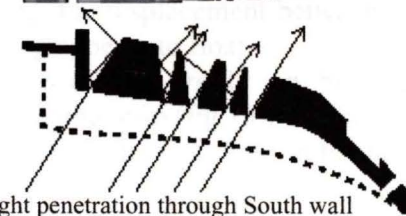
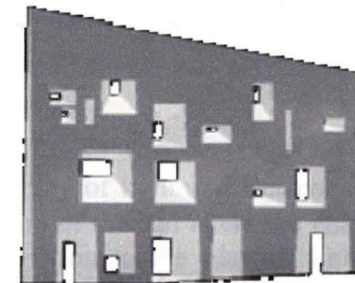


Fig.15 Light penetration through South wall

¹⁰ Study conducted through various books/ articles on the works of Le Corbusier
Pauly, Daniel, The chapel at Ronchamp (Le Corbusier Foundation, Basel 1997)
Stoller, Erza, Chapel at Ronchamp (Princeton architectural Press, NY, 1997)

Louis Kahn: National Assembly Complex¹¹ (Dacca, Bangladesh; Latitude 23,43N)

Louis Kahn on the other hand plays with light in order to create forms with shadows as shown in fig.15. One of the best examples this is the Assembly complex in Dhaka. "The Citadel of the institution of man"¹² as Kahn liked to refer to the assembly does indeed resemble a fortress; the fact that it is surrounded by water and is connected only by ramps and bridges to the main land reinforces the notion of a fortification. The building is sensitive to its geographical location. Based on the angle of the sun, light has been used in the vernacular method, from the sides and indirectly, in this case - through a modified "courtyard".

The Assembly hall is surrounded by a ring shaped ambulatory. Upon entering this transitional space, one is captivated by the magnificence in the play of light. Sunlight, streams through glass blocks in the roof,

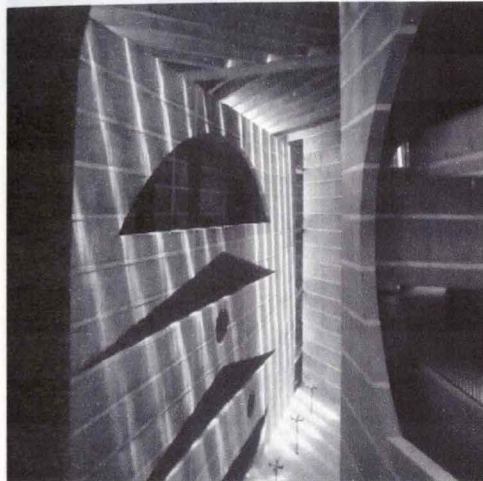


Fig.19 Play of light and shadow at the National Assembly.

caresses the walls and flows into the interior. The strip configurations of the glass blocks in the

ribbed roof are mutually arranged at right angles and, as a result the play of light and shadow on the walls and the floor is made even more interesting. The daily progression of the sun alters the character and the atmosphere of the common space, adding yet another dimension to the play of light and shadow. As the inner shell of the offices does not extend to the ceiling, the displacement between the light source and the visible sunbeams is clearly visible: the ribbed ceiling appears to float.

The staircase and corridors leading to the Assembly halls and the offices are lit up by huge semicircular, circular and triangular punctures in the walls flanking the ambulatory (fig.19). The core of the central building is penetrated by eight wedge shaped light shafts. The apices of these light shafts

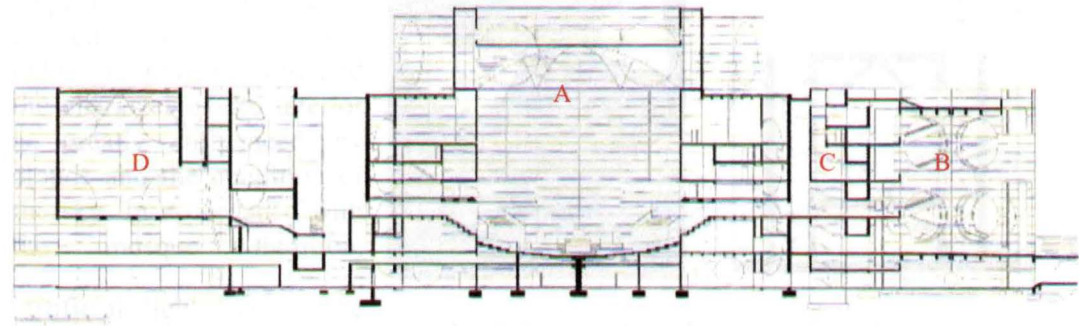


Fig.18 Section through the Assembly

¹¹ Study conducted through various books/ articles on the works of Louis Kahn
Buttiker, Urs, Louis I. Kahn, (Birkhauser Verlag, Basel, 1987)

¹² Ronner, H.; Jhaveri, S.: Complete Work 1935-74; 2nd ed. pp. 238 ; (Birkhauser Verlag, Basel, 1987)

define the octagon of the assembly hall (fig. 16).

Recessed slot windows, extending over all the stories are used to illuminate the stairway complex. A rectangle, a vertical triangle and a circle on the side, located in each corner housing a light shaft, filter direct incident light (fig. 18). However the main source of light still remains the glass block roof above the atrium.

In contrast the prayer room is characterized by absolute introversion, with no view of the outside, no windows, no openings, only the light from above. Unlike the offices the

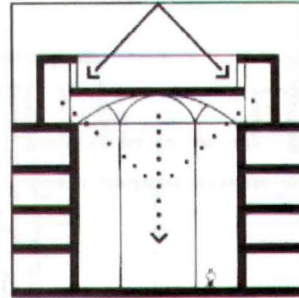
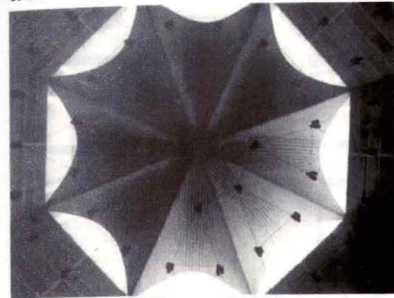


Fig.20 (A) Photograph and lighting analysis of space

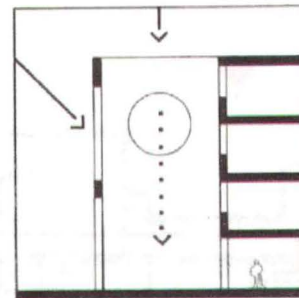
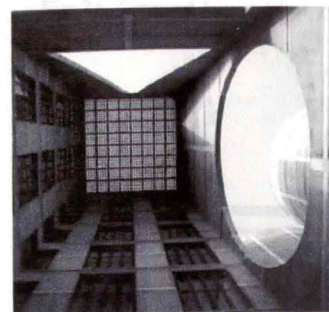


Fig.22 (C) Photograph and lighting analysis of space

light shafts in this part of the complex are open to sky.

Depending on the time of the day, rays of sunlight enter the prayer room and the character of the interior is greatly influenced by clouds and the condition of the sky. In accordance with the mosque tradition,

artificial light fixtures are

hung low, creating a subdued and intimate atmosphere during the night.

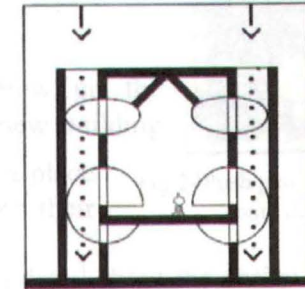
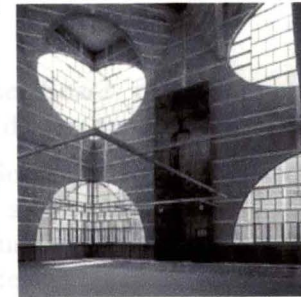


Fig.21 (B) Photograph and lighting analysis of space

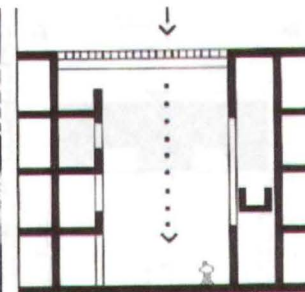
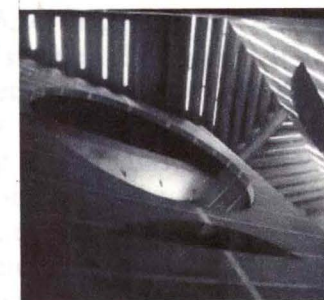


Fig.23 (D) Photograph and lighting analysis of space

The Glasgow School of Art

As the objective of this essay is to study the use of natural light in the design of this school and in order to answer the question of effective usage of natural light the research methodology includes both a thorough physical study of the building and an intensive consultation of books, articles and websites.

In spite of numerous writings on the school, few address the use of natural lighting in the building, therefore the main source of information is the hours spent in various spaces of the school studying the changing light and the affect it had on surfaces and materials.

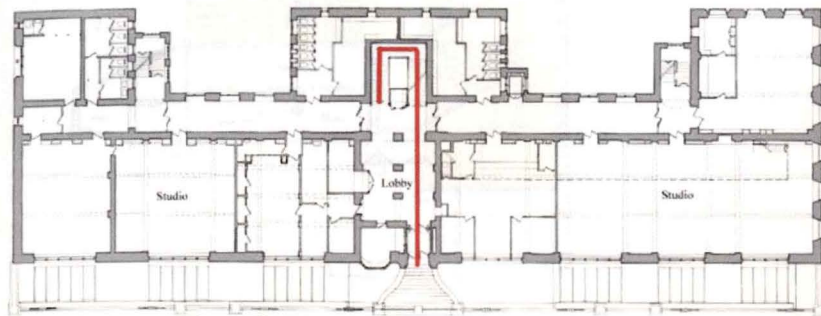


Fig.25. Ground Floor Plan

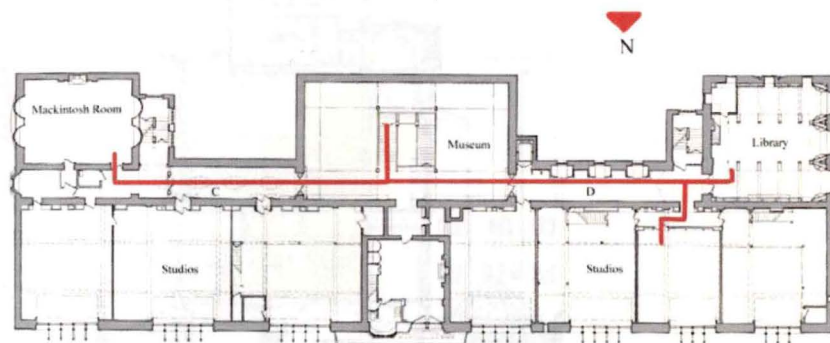


Fig.26. First Floor Plan

In June 1896, the Board of Governors drew up the conditions for the design competition of the new building for The Glasgow School of Art, visualized as a place to educate artists, architects and designers for their role in the new industrial society.

The brief for the design competition speaks in detail about the design of each space in a pragmatic manner, dictating the room sizes, orientation and natural lighting.

The plan (fig.25,26 and 27) of the building is a simple E shape. It maximizes street frontage on three sides. Corridors run the length of the building, serving the studios and are located on the north. At the east and west end of the corridor a unique condition is created, where the special rooms are located, the Board room (Mackintosh room) and the Library.

Being placed at end of the building enables these rooms to acquire sunlight from more than one direction.



Fig.24 Push plate of main door

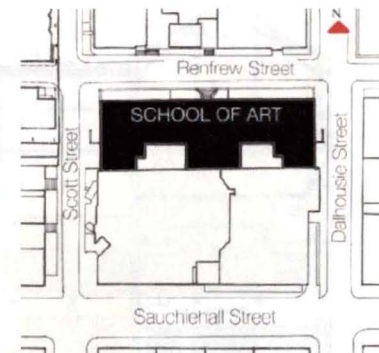


Fig.27 Site plan of the Glasgow School of Art

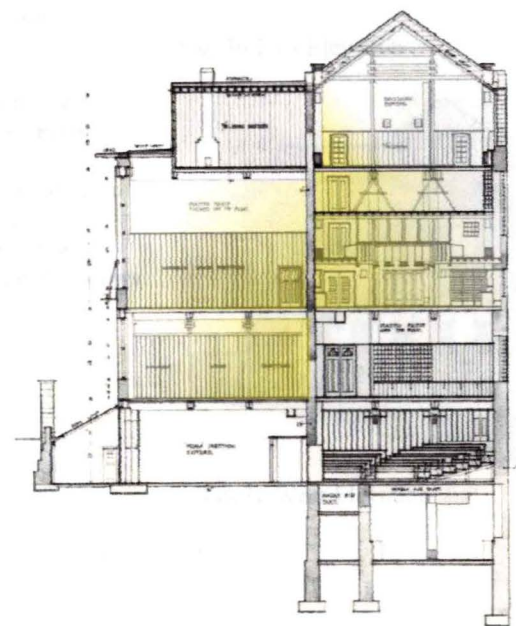
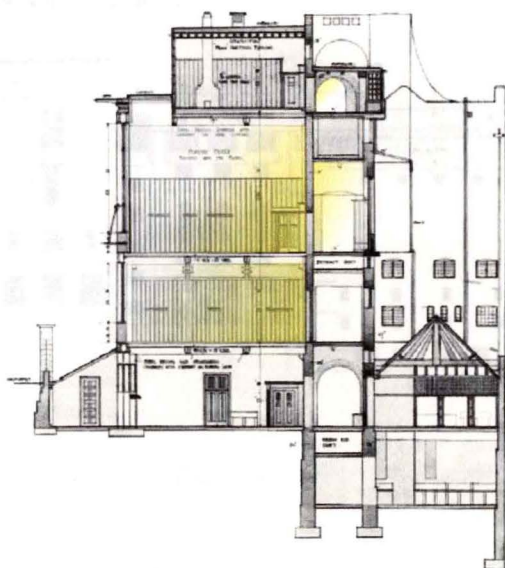
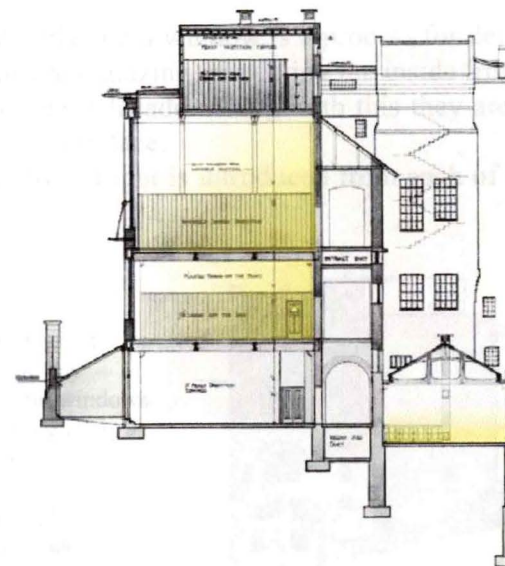
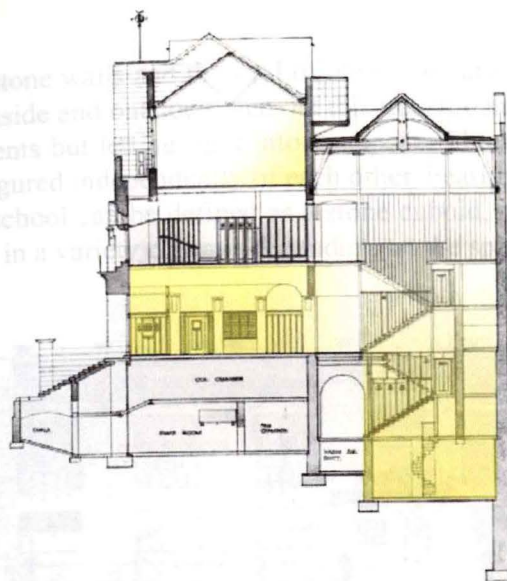


Fig.28 Sections through the School of Art

The stone walls and the roof of the school are punctured to let light from the outside into the inside. Placing a window is a process for defining the inside and outside space. At this transitional moment in the wall occurs the window with its frame and glazing, protecting the inside from the elements but letting light into the space. The windows designed by Mackintosh are all different on each façade. Along with this they are also configured independently of each other, bearing a relationship only to the outer wall face or the inner room face. The school can be defined as a stone cuboid, punctured in all faces, North, South, East, West and Roof. Light is introduced from each of these faces in a variety of ways depending on the space and its function.

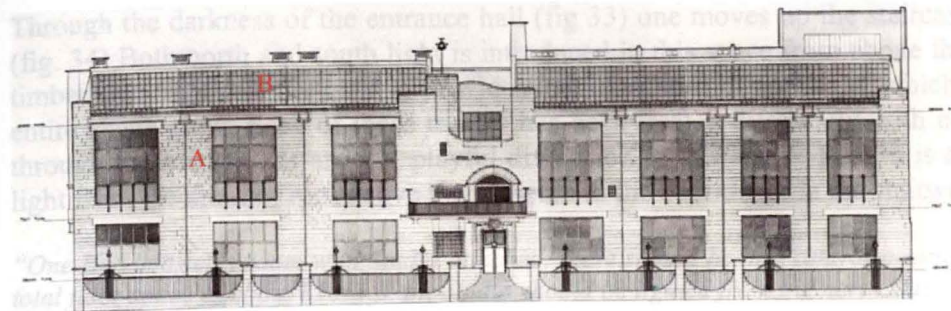


Fig. 29 North Elevation

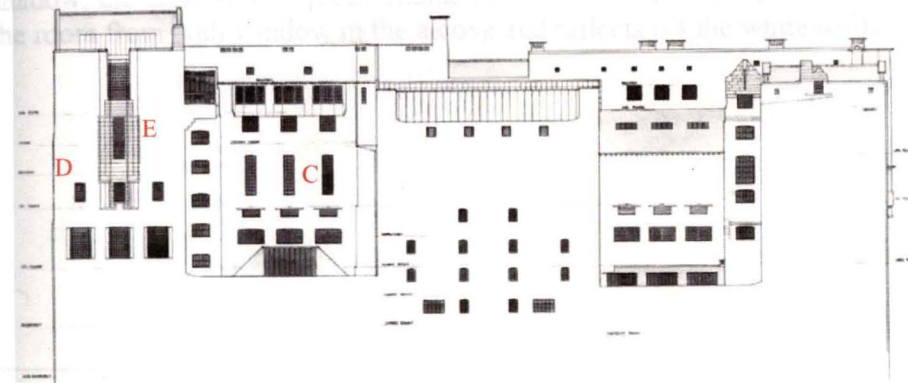


Fig. 31 South Elevation

North Elevation: Steady light throughout the day
A) Large studio windows
B) Continuous glazing
Roof studios

South Elevation: Strong light
C) Corridor windows
D) Library Windows
E) Flower Studio

Window

East Elevation: Morning light
F) Mackintosh Room

West Elevation: long durations of light from dropping sun
G) Studio Windows
H) Tall Library Windows

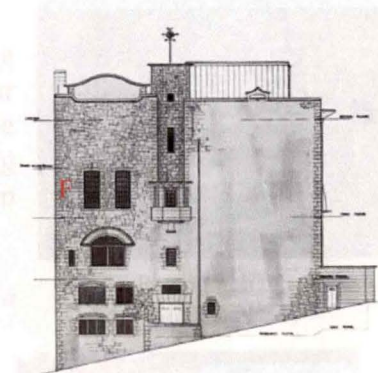


Fig. 30 East Elevation

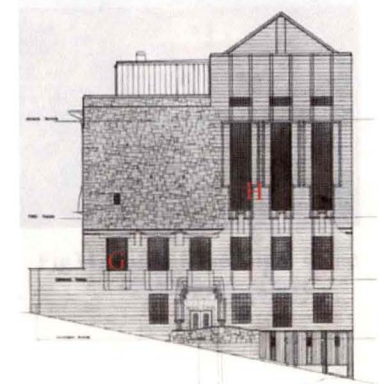


Fig 32 West Elevation

A Daylit Journey Through The School

The Entrance hall is a transitional space between the outside world and the interiors of the school. It is a dark vaulted space, but the light streaming down through the stairwell invites one into the building.

The Museum

*"The School Museum need not be a special room, but be a feature in connection with the staircase."*¹³

Through the darkness of the entrance hall (fig 33) one moves up the staircase, which leads to the museum space (fig. 34) Both north and south light is introduced in this space from above through a glass roof supported on four timber trusses. The large glazing provides long durations of soft light, which reflects off the walls and makes the entire space glow. Each of these trusses has been treated differently with motifs cut into them. Light streaming through these cuts adds another playful dimension to this space. Fig. 36 is a section showing the filtering of top light from the monitor roof above the museum to the basement via the stairwell.

*"One Headmaster's room with Studio attached, these should be in a central position on the upper floor, and should have a total floor space of about 850sq.ft. the studio should be lighted from the north side."*¹⁴

A tall dark Anteroom separates the Director's room from the museum. Mackintosh again plays with light and shadow, the dark waiting room dramatises the first white room to be designed by Mackintosh. Light bursts into the room from both window in the alcove and reflects off the white walls.



Fig33. Photograph of Entrance lobby

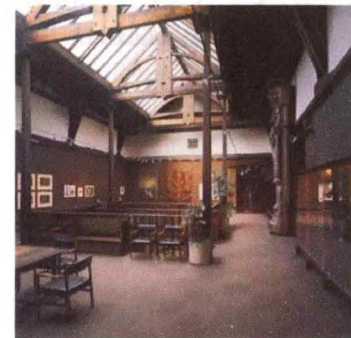


Fig34. Soft diffused light in the Exhibition gallery

¹³ Conditions of Competition, No. 15; Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994

¹⁴ Conditions of Competition, L ; Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994



Fig35 Photograph looking down the stairwell from the level of the Exhibition gallery



Fig38 Quality of light in the stairwell

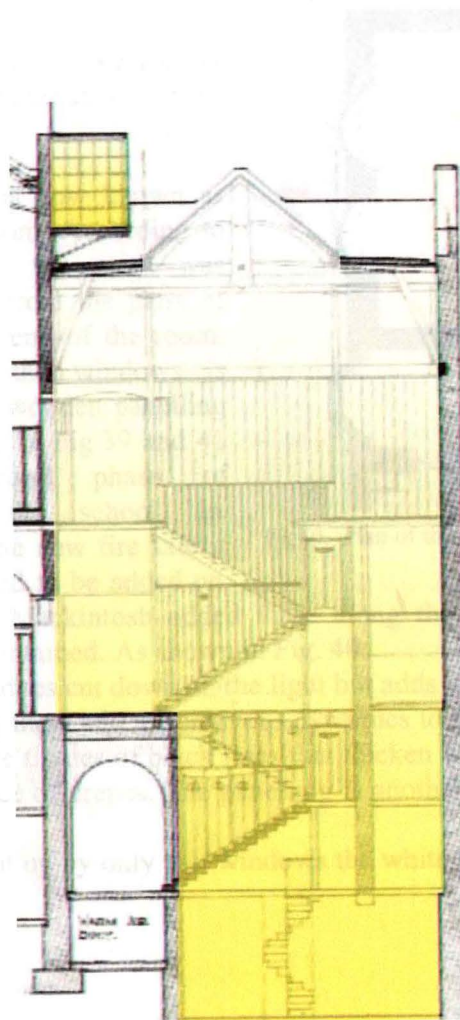


Fig36. Section through school showing top light filtering down to basement level



Fig 37 Glass roof and wooden trusses in Exhibition gallery

The Board Room

*"...Board Room to have a floor space of about 900 sq. ft.; This should be on the upper floor and may be ceiled low enough to admit of the presence of studios above, for the staff. These studios should have a north top light."*¹⁵



Fig39. Mackintosh room / White room

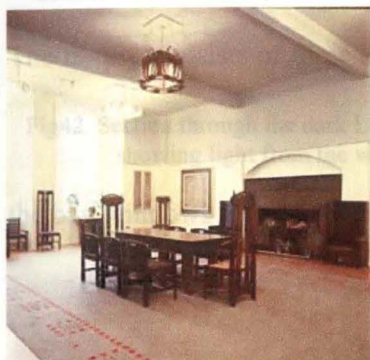


Fig41. Mackintosh room / White room

The Board Room is now known as the Mackintosh Room. According to the original plans, the room was flooded with light from the pairs of windows on either end of the room; the curvature of the windows is accentuated by the wooden panelling in the bays, evident in Fig.39 and 41. During the second phase of construction of the school, in accordance with the new fire safety laws a staircase had to be added on

the western side. Mackintosh added these along the windows on the east end of the room, the windows at this end were maintained. As shown in Fig. 40.

The addition of the staircase does cut down on the light but adds to the play of shadows in the room. Shadows of the steps and of people using them add mischievous dynamics to the serious room. The wooden panelling on the bays casts shadows like dense tissues of black lines that thicken with luminosity and throb with thread like tonal contrast, giving it a semblance of drapes. The panelling is another example of Mackintosh toying with light and the effect it has on a surface.

Though the room is chiefly lit up by only two windows the white walls reflect the light, adding to the luminosity of the room.

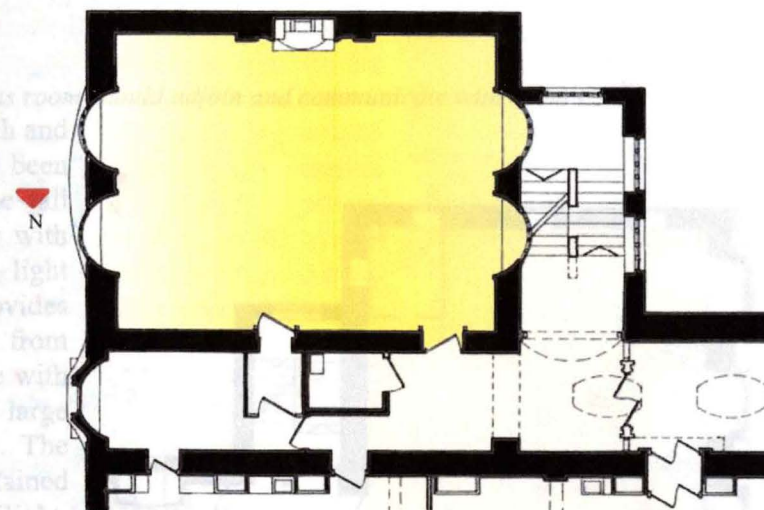
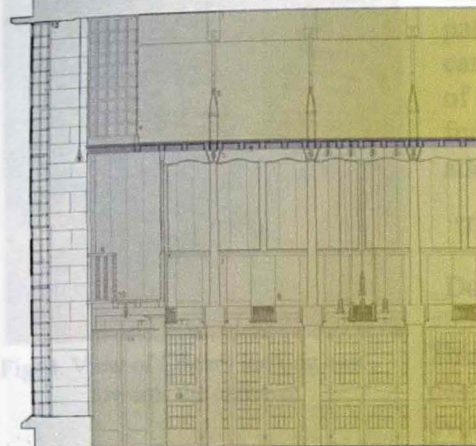


Fig40. Plan of the Mackintosh room, showing light from the east

¹⁵ Conditions of Competition, O ;Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994

The Library

*"One school library and Reading Room with a floor space of from 1000 to 1200 sq. ft. This room should adjoin and communicate with room C."*¹⁶



The library consists of three spaces, although only two are apparent, the library and

Fig42. Section through the dark Library, showing light from the west

The Library is lit up by using west, south and east light. Most of the light has been introduced into this space through the tall windows on the west. Windows along with some built in seating space provide light from the south and a small window provides light from the east. The dropping light from the west converts the room into a space with the light quality similar to that in a large paper lantern. The entire room glows. The light is accentuated against the dark stained wood interiors, creating the feel of twilight. The tall wooden posts are seen as silhouettes of trees in a forest, making the central area comparable to a clearing in a forest.

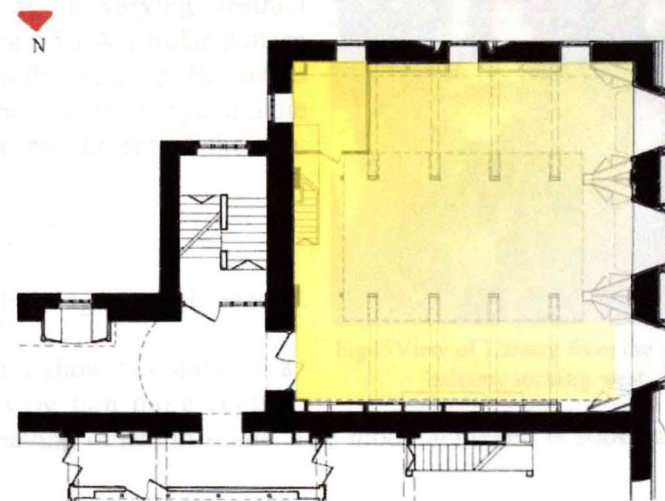


Fig43. Plan of the Library, showing light from the west, south

its balcony. The third space, the book store is located above the library space.

During the day the room is lit by floor to ceiling windows on the west wall. The store has internal windows, which are inverted versions of the external bay window. It is only when one looks up into the bay windows that the inner windows of the store are revealed. Evident in fig 47

¹⁶ Conditions of Competition, D ;Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994



Fig44. View of Library looking east towards the entrance

The library is a space animated by light. Occasionally it withholds some of its content but at other times it also incorporates the viewer directly into the space. The play of light and shadow stimulates ones power of imagination. At the top of the balcony there is a band of wood, gently undulating around the room. This extends below the balcony, ending in varying abstract patterns. These are often compared to an abacus.(fig 55.) A similar pattern can also be found in the furniture. (fig 53) Natural light picks up the curves of the panel and filters through the ovals carved in the balcony fringe and the furniture, casting shadows, which animate with the movement of the sun. adding to the feel of being in a forest.

*"The lighting of the School is proposed to be by electricity."*¹⁷

During evenings and daytime in winters, artificial lighting is much needed.

This gave Mackintosh a new arena to experiment and show his skills as a designer. He designed lighting fixtures (fig. 52), giving him more control over light, choosing to illuminate specific area and leaving others in shade. The mood achieved is sober and reflective, wholly conducive to study

*"the veil with its tissue of hyacinth, purple, scarlet and fine linen recalled the elements, and divided the outer temple from the sanctuary, as the earth is divided from the heavens."*¹⁸

Mackintosh instead of using light to eradicate mysteries and uncertainties concentrates on the contrasts it creates playing with the oppositions of light and darkness, day and night. He brings the entire space to life, alive with optical adventure.

*"From the high tops of the windows light falls through the library's many posts in a way that is reminiscent of light filtering down through tall trees. The library then becomes a small clearing in some quiet northern forest. In the centre of this clearing a great sunburst blazes from the lights suspended from the ceiling."*¹⁹

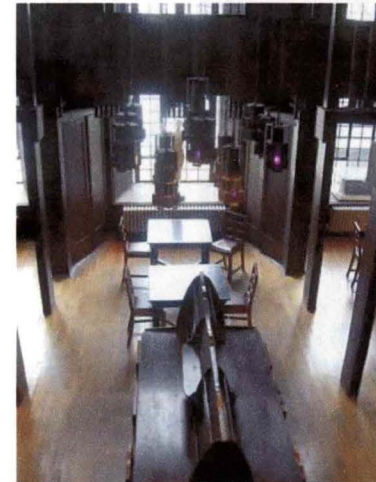


Fig45 View of Library from the balcony looking west

¹⁷ Conditions of Competition, No.14

¹⁸ Leathby, W.R, *Architecture Mysticism and Myth*, 1981 (republished 1974), Architectural Press, London, p.31

¹⁹ Mackintosh's Masterwork The Glasgow School of Art, pp.114 ;Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994

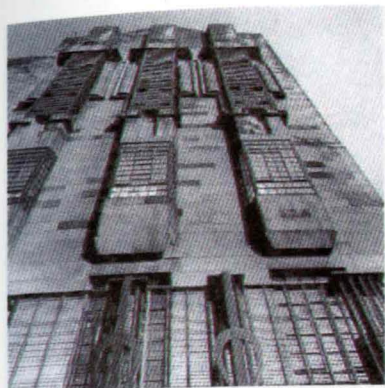


Fig46. View of Library windows on the western facade

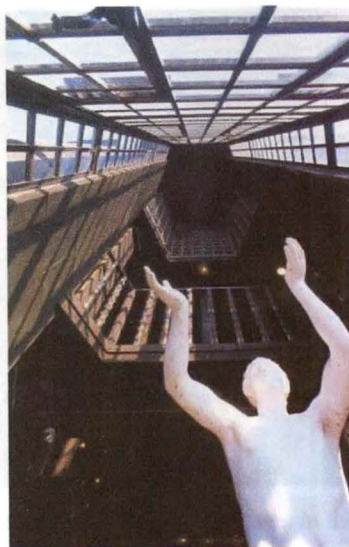


Fig47. Looking up towards balcony and store along the windows on west

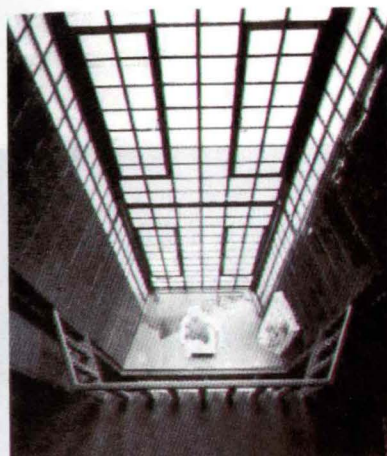


Fig49. Looking down from the store room along the windows on west



Fig49A. Window at balcony level on the eastern face

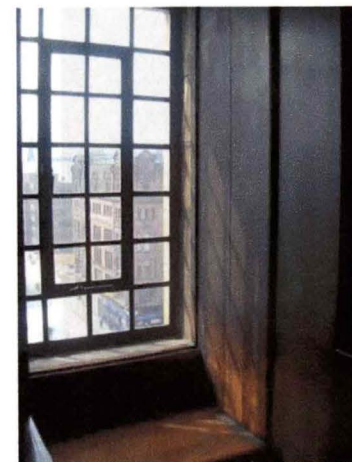


Fig48. Window with seating, on the south

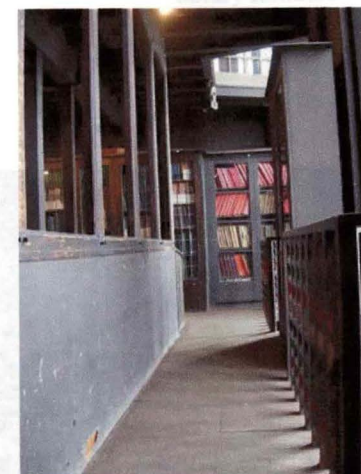


Fig50. Photograph at Balcony level

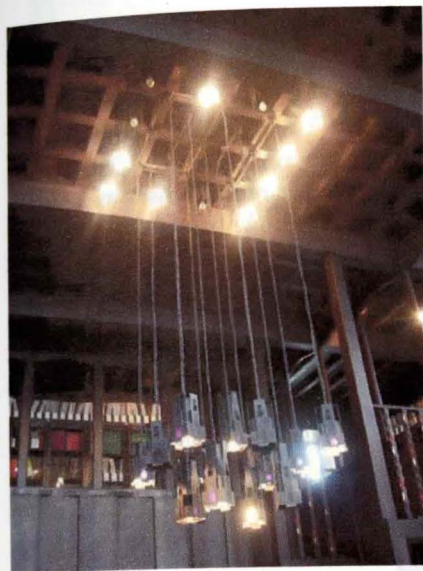


Fig52. Electric light fixtures in the library



Fig53. Abacus like pattern on library furniture

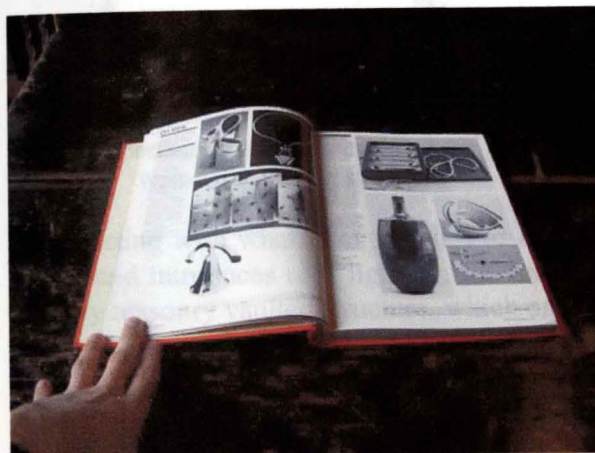


Fig54. Quality of light in the library

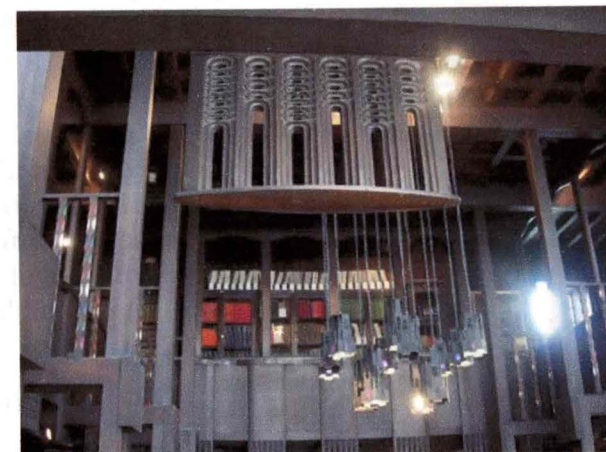


Fig55. Light from window at balcony level

The Studios

"Rooms for Still Life and Flower Paintings- two in number. (1) For Advanced and Elementary Still life, say $72' \times 35' = 2520 \text{ sq. ft.}$ divisible by movable partitions. (2) Flower Painting Room say $40' \times 23' = 920 \text{ sq. ft.}$ room (1) should be lighted entirely from the north side; Room (2) may be lighted from the ends or by a north top-light and should have attached to it, a conservatory, with an exposure to the sun, in which plants and flowers, when not in use may be kept."²⁰

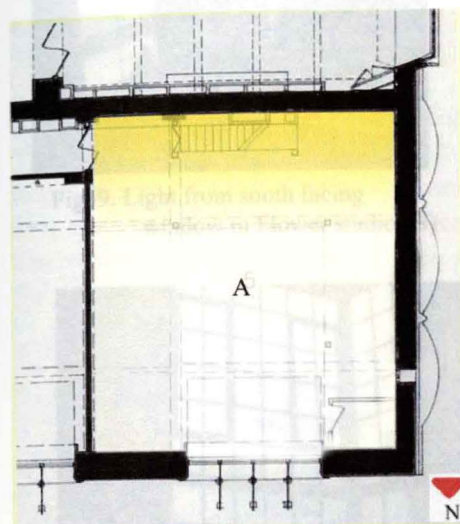


Fig 56. Section showing lighting in a typical north facing studio (A)

The Studios are probably the most important part of the school. As the brief specified, the studios were all placed along the north face, with large windows, so that they get constant amount of natural light, much needed for painting. These windows are the most prominent feature in the north elevation.

The original studios were provided with artificial lighting. Electric bulbs on pulleys were suspended, giving each student the flexibility to move the light

according to their convenience.

The natural lighting is unique to each studio space. Depending on the location, Mackintosh introduces light from the sides or through the roof, or both. He often humours with the building user, by giving it a look that conflicting with what is expected. For example in the basement studios he uses the set back from the boundary wall and introduces roof lighting, the roof supported by a wooden truss (fig. 58). And in the logia introduces a heavy masonry vaulted structure, which one expects to see in the cellar rather than on the second floor (fig 60.).

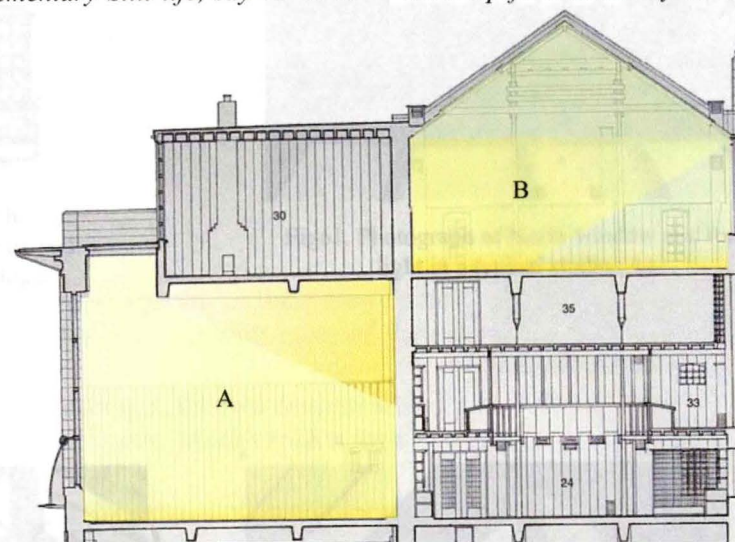


Fig 57. Section showing lighting in a (A) typical north facing studio and the (B) Flower studio

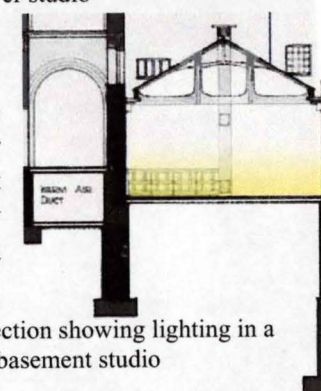


Fig 58. Section showing lighting in a basement studio

²⁰ Conditions of Competition, F ;Mackintosh's Masterwork The Glasgow School of Art; Chambers, Edinburgh, 1994



Fig59. Light from south facing window in Flower studio (B)

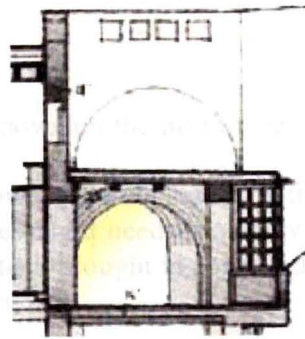


Fig60. Section showing heavy masonry structure and lighting in the loggia



Fig61. Photograph of North window and roof light in a typical studio (A)



Fig62. South facing window in Flower studio (B)

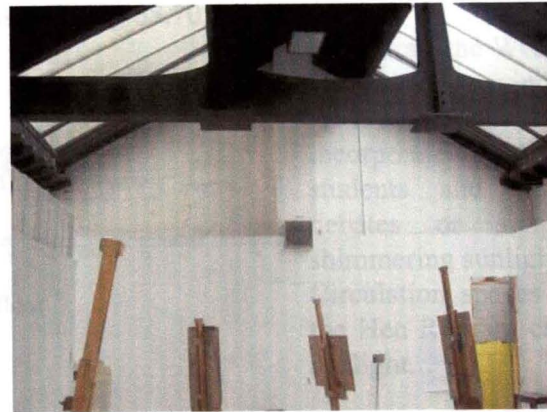
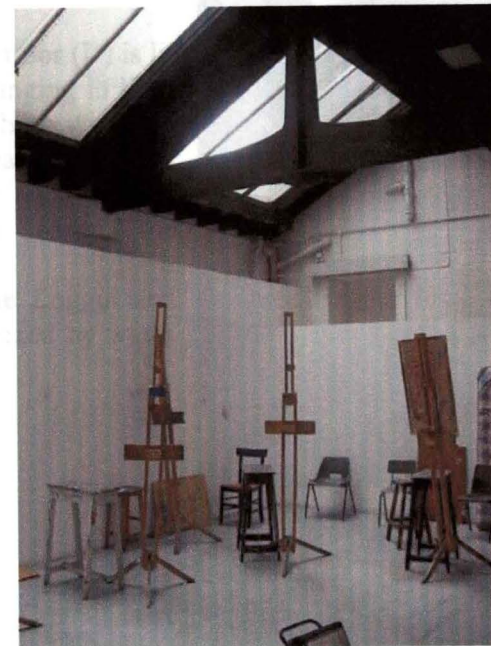


Fig63. Top lighting in basement studio.

Fig64. Top lighting in basement studio



The first floor studios are lit by the characteristic large windows on the north face. Along with this, roof lighting has also been introduced near the windows (fig. 61).

Located in the south-east corner of the second floor is the flower painting studio, with a conservatory cantilevered from the side (fig. 65). Mackintosh understood flowers and the best light needed to study them and this is evident from his paintings. To bring out the true depth of the flowers Mackintosh brought in south light, low rays of light from the west and soft top lighting from the north, through two large roof lights.

Circulation Space

"The corridors should not be less than 10 feet wide. They should be well lit and have good wall spaces..."²¹

Mackintosh has treated each circulation space in a different manner, making them usable spaces, in their own accord. They have been designed so that students can interact, paint and enjoy them. They are adorned with casts of various masterpieces, doubling up as a museum.

The corridor on the first floor, eastern wing (fig. 66, C) is lit up by ogival roof lights, giving it its own distinct identity. The white ceiling punctured by the roof light is accentuated by the dark stained timber joists. Mackintosh's love for contrasting black and white is evident here as well (fig 68,70).

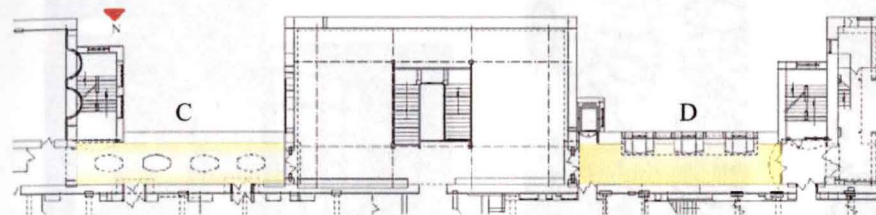


Fig66. Natural lighting in corridors C and D on the 2nd floor

In contrast the Western corridor (D) is lit by three large windows bringing in light from the south. (fig 67) These windows incorporate a set of seats, used by students and staff for discussions, debates or simply to enjoy the shimmering sunlight.

Circulation spaces like the Loggia and the Hen Run are characterized by warm sunlight.



Fig65. Conservatory in Flower studio.



Fig67. Photograph corridor D

²¹ Conditions of Competition, No.15

As opposed to the large windowpanes used in the studios, smaller panes characterize the glazing in the circulation spaces; resultantly the mullions and styles cast beautiful shadows across the floor, adding a playful dimension to the spaces. A stone staircase and a dark passage at one end connect to the transparent chamber, held above the city, giving beautiful views to the hills in the south, beyond the city skyline. At the other end lies the Loggia, a brick masonry structure covered by groin vaults. It doubles up as a workspace, allowing light in from the bays along the south face. It is equipped with foldable desks allowing students to draw or paint in the south light. The walk from the

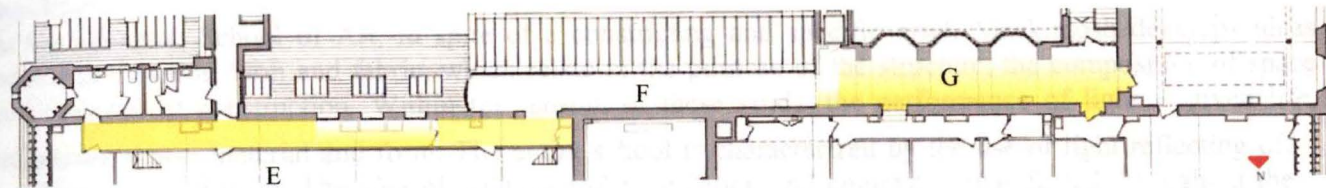


Fig69. Natural lighting from dark corridor (E) via Hen Run (F) to the Loggia (G)

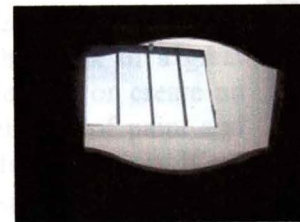


Fig68. Ogival roof light

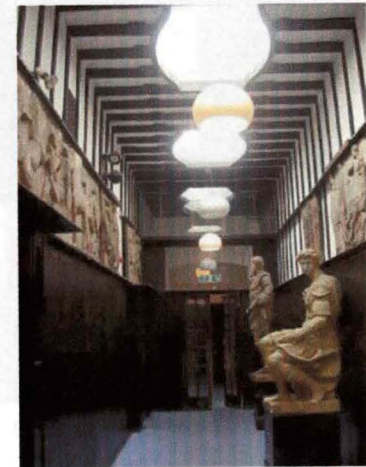


Fig70. Photograph corridor C



Fig71. Images of Corridor E

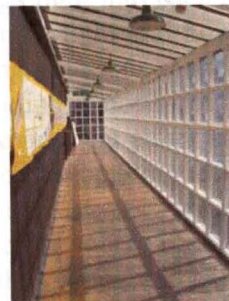


Fig72. Hen Run (F)

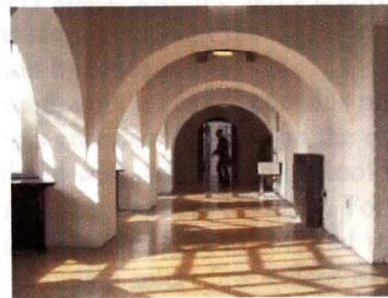


Fig73. Loggia (G)

dark corridor (E) reached through a stone staircase; via the Hen run (F) to the Loggia (G) is again evidence of the delight Mackintosh takes in contrasting spaces. Not just in terms of light and dark but also heavy and light structures, obvious from the slender form and structure of the Hen run to the heavy robust Loggia.

Conclusion

Light can only be understood when it enters a space or hits a surface. The light manifests itself indirectly through the medium or surface it strikes, be it a face, mountains or a stone wall. The mark of a great architect is his ability to understand the nature of light and exploit it to convey a feeling or create an atmosphere. This command of the medium can be compared to that of Rembrandt, his use of paint and varnish to capture and express forms revealed by light, transforming a flat canvas, to feel like skin. It's a magical moment when light becomes alive be it in a piece of art or a building. Dark backgrounds were often used in paintings so that any use of colour jumped out at the viewer. Mackintosh also does this with his buildings.

In the Glasgow School of Art, in spite of a constricting and specific brief, Mackintosh develops ideas regarding function form and fabric, which relate to the purpose of the structure, the composition of space and material of construction. Within the tension of these voids, the performance of light is given life, enhancing space, material and form. The entire school is characterized by the use of light reflecting off surfaces to reveal them. The idea of light control modulation and contrast is manifested throughout the school.

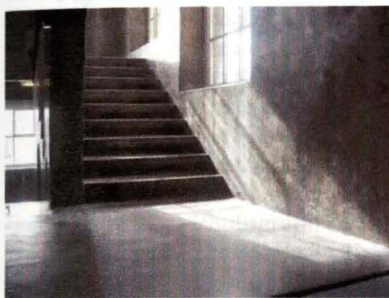


Fig75. Light reflecting off walls and floor in the stairwell

He brings light into each and every space with the skills and finesse of a ballerina. Mackintosh understood the direction of light and how it transforms through the day. He brings in light from all directions, modulates it according to the space and function it is meant for.

The building is north-south oriented, with a central corridor running across from the east to west. Rooms have been provided on either side of this corridor. Apart from the cardinal directions light has been brought in from the top of the building, often clubbed with side lighting. Roof lighting has been used in the Museum space and various studios, the flower studio being the best example. For the studios though large windows on the north are the chief source of natural lighting. Bringing in soft and steady light, ideal for painting. The strong sun of the south is brought in carefully in only a select few spaces like the library, Hen run and the Loggia. Along the East curved windows bring light into the Mackintosh room, owing to their curved profile they also permit light in from the north and south. Western light is used to illuminate the library and studios on the western end.

The design of the school is based on the brief. But it does not end there; Mackintosh has fulfilled all the requirements of the brief and then went beyond it by achieving an aesthetically stimulating building.

A lot of thought has gone into the location shape and size of light penetrators. A symbiotic relation has been created between light and building materials. Light brings out the texture and the nature of the materials used, while they in turn help in realizing the quality of light. The combination of the two creates an atmosphere, inducing emotions and moods to a stone cuboid.

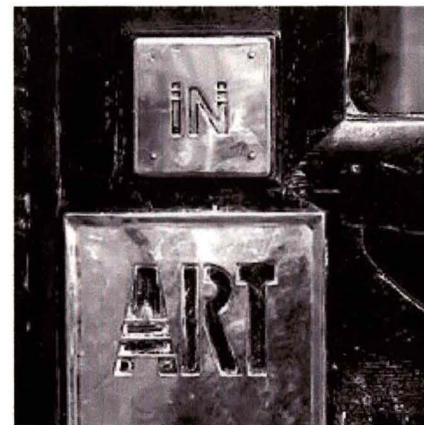


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A TALE OF TWO CITIES

For and Chandigarh

Harvey Tandon

